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- **The performance of Fosterera® PRRS was evaluated when breeding animals were confronted with a severe challenge from porcine reproductive and respiratory syndrome (PRRS) virus.**
- **Vaccination with Fosterera PRRS reduced the adverse reproductive effects of a severe challenge in a study that also substantiated the vaccine's 19-week duration of immunity for PRRS reproductive disease.**
- **Safety studies have demonstrated that in PRRS virus-naïve gilts, Fosterera PRRS had no detrimental impact on farrowing performance regardless of when the vaccine is administered and even when accidental vaccine exposure occurred.**

Fosterera® PRRS effective, lasting, safe despite 'worst case' challenges

It's well known that modified-live porcine reproductive and respiratory syndrome (PRRS) vaccines help reduce production losses in breeding herds with PRRS.¹ But when the challenge is especially severe, how well and for how long will a PRRS vaccine perform — and is it safe, even if breeding animals naïve for the PRRS virus are accidentally exposed?

"We wanted to find out how Fosterera® PRRS performs in the 'worst case' scenarios that sometimes confront breeding herds," said Rick Swalla, DVM, technical services veterinarian, Zoetis. Toward that end, Zoetis designed trials to test the vaccine's efficacy, its duration of immunity (DOI) and safety when stacked up against severe PRRS virus challenges.

In one of the studies, investigators obtained 70 healthy, cross-bred gilts from a Minnesota producer.² Half received one dose of Fosterera PRRS about 50 days before breeding. At about 85 days of gestation during the third trimester, 39 were challenged with the PRRS virus isolate NADC-20.

"This was a severe challenge because NADC-20 is one of the most virulent PRRS virus strains circulating in North America, and reproductive failure is most likely to occur when infection occurs late in gestation.³ This is the type of scenario pork producers hope to never encounter," Swalla said.

More viable piglets

Among the control group, there were only nine live pigs born and four viable pigs, which demonstrated the severity of the challenge. In the Fosterera PRRS group, there were 155 live pigs born and 134 were viable (Table 1). Put another way, gilts that received Fosterera PRRS had 33 times more viable piglets compared to unvaccinated controls (Figure 1), the veterinarian said.

Substantiates 19-week DOI for reproductive disease

The challenge to gilts was administered about 19 weeks after vaccination, so the results substantiate the vaccine's DOI claim of 19 weeks for PRRS reproductive disease, he said, and noted that the DOI for PRRS respiratory disease is 26 weeks.

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"...Fostera PRRS reduced the percent of gilt sick days by 92.5%."

Table 1. Piglet viability outcomes

Parameter	Control	Fostera PRRS
Total piglets born	244	251
Live	9 (3.7%)	155 (61.8%)
Viable	4 (1.6%)	134 (53.4%)
Low viability*	5 (2.1%)	21 (8.4%)
Dead	235 (96.3%)	96 (38.2%)
Stillborn	80 (32.8%)	60 (23.9%)
Mummies	155 (63.5%)	36 (14.3%)

* Piglets weighing less than 1kg at birth or non-ambulatory piglets

Clinical signs after challenge were primarily depression and inappetence, but there were far fewer in vaccinated gilts and they resolved quicker compared to the unvaccinated, challenged group. "In fact, the mean percent of observation days with any clinical sign of PRRS was 46.8% in controls and only 3.5% for the Fostera PRRS group," Swalla said.

The study results are especially relevant because PRRS still costs producers more than \$580 million annually,⁴ and a substantial portion of the economic damage occurs in breeding herds. Losses are largely due to fewer weaned pigs,⁵ which obviously requires viable piglets, he said.

Accidental exposure

"Worst case" studies were also conducted to test the safety of Fostera PRRS when accidental exposure occurs. In one of the studies, 76 healthy, PRRS virus-naïve gilts received either a single dose of Fostera PRRS or a sham injection of vaccine diluent at about 90 days of gestation.⁶

"The investigators didn't rely on animal-to-animal contact for virus transmission," Swalla said. "Instead, PRRS virus-naïve gilts were injected intramuscularly to ensure a substantial degree of virus exposure, which was confirmed by checking PRRS virus antibody titers."

There were no clinical signs of systemic PRRS virus-associated disease among vaccinates, no anorexia or lethargy, and no animals died. Piglets of some vaccinates had dyspnea and were thin, gaunt and rough-haired. In addition, piglet weaning weights and average daily gain during the birth-to-weaning period were reduced, but these findings came as

Figure 1. Percent of piglets born viable



“Most notably, the study demonstrated that accidental exposure to Foster PRRS vaccine virus at 90 days of gestation did not compromise farrowing performance in PRRS virus-naïve gilts.”

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no surprise considering a full dose of vaccine virus was administered to third-trimester PRRS virus-naïve gilts, Swalla said.

“Most notably, the study demonstrated that accidental exposure to Foster PRRS vaccine virus at 90 days of gestation did not compromise farrowing performance in PRRS virus-naïve gilts,” he said.

In the Foster PRRS group, there was a higher rate of stillbirths, but no abortions occurred and no differences were observed between groups in the average number of pigs born or pigs born live per litter. Similar results were found when a comparable study was conducted with naïve sows.⁷

These outcomes were observed even though PRRS virus viremia was detected at birth in 53% of piglets born to gilts, Swalla noted.

Timing of vaccination

Yet another study involving 1,200 gilts and sows showed that Foster PRRS posed no hazard to the farrowing performance of PRRS virus-naïve gilts regardless of when the vaccine was administered.⁸ The animals were divided into pre-breeding and first-, second- and third-trimester gestational groups. Within each group, 200 received one, 2-ml intramuscular injection of Foster PRRS, and 100 served as controls and received saline or sterile water.

All the animals were observed for adverse reactions within 1 hour, at 6 hours and 1 day post-vaccination, and clinical observations were conducted at approximately weekly intervals starting on day 7 until study conclusion on day 21. Injection-site reactions were minimal and similar in all groups. There were very low rates of abnormal post-vaccination reactions such as anorexia and depression, low rates of abnormal clinical signs such as lameness and there were no observations of diarrhea or dyspnea.

continued



¹ Vansickle J. How to manage PRRS-negative pigs. National Hog Farmer. 2011 June 16.

² Data on file. Study Report No. 3127R-60-11-988, Zoetis Inc.

³ Ladinig A, et al. Maternal and fetal predictors of fetal viral load and death in third trimester, type 2 porcine reproductive and respiratory syndrome virus infected pregnant gilts. Vet Res. 2015;46:107.

⁴ Annual PRRS Costs Fall \$83.3 Million – Productivity gains blunt the impact of PRRS on the U.S. herd. Pork Checkoff. 2017 June 1.

⁵ Holtkamp D, Kliebenstein J, Zimmerman J, Neumann E, Rotto H, Yoder T, Wang C, Yeske P, Mowrer C, Haley C. Assessment of the economic impact of porcine reproductive and respiratory syndrome virus on U.S. pork producer. National Pork Board Research Report. 2011;NPB #10-158.

⁶ Data on file. Study Report No. 12ORBIOPOK02, Zoetis Inc.

⁷ Data on file. Study Report No. 12ORBIOPOK03, Zoetis Inc.

⁸ Data on file. Study Report No. B921R-US-13-143, Zoetis Inc.

⁹ Angulo J, et al. Efficacy of a PRRSV MLV vaccine against a genetically diverse range of PRRSV isolates. 2015 Allen D. Leman Swine Conference.

¹⁰ Calvert J, et al. Attenuation of a virulent North American porcine reproductive and respiratory syndrome (PRRS) virus isolate on CD163-expressing cell lines, and demonstration of efficacy against a heterologous challenge. 2012 Am Assoc Swine Vet annual meeting.

¹¹ Renukaradhya GJ, et al. Live porcine reproductive and respiratory syndrome virus vaccines: Current status and future direction. Vaccine. 2015;33:4069-4080.

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Overall farrowing rates were similar in vaccinates and controls, and farrowing rates were similar for all gestational groups (Table 2). Vaccinates and controls generated similar rates of live-born, viable piglets, low-viability piglets, stillborns and mummies, Swalla said.

Table 2. Farrowing rates by gestational group in vaccinates and controls

Gestational class	Control		Fostera PRRS	
	n	Farrow rate	n	Farrow rate
All gilts/sows	397	92.9%	795	93.3%
Pre-breeding	100	82.0%	200	84.0%
1st trimester	100	99.0%	200	96.0%
2nd trimester	99	94.9%	199	95.5%
3rd trimester	98	95.9%	196	98.0%

Important features

Fostera PRRS is labeled for vaccination of healthy, susceptible swine in herds positive for PRRS virus, as an aid in preventing reproductive and respiratory diseases caused by the PRRS virus.

The vaccine has several important features. It protects against a diverse range of PRRS virus field strains.⁹ It's also the only commercial PRRS vaccine labeled for administration as early as day 1 of age — which is another testament to its safety, he said.

In contrast to other PRRS vaccines, Fostera PRRS is produced with a unique attenuation method that utilizes a recombinant pig kidney-cell line.¹⁰ The vaccine replicates well. Other PRRS vaccines are attenuated using a monkey kidney-cell line, and it can take several generations of viral replication to adapt and grow on pig macrophages — the primary cells that PRRS viruses infect.¹¹

"Producers can have confidence that Fostera PRRS will help mitigate the adverse reproductive effects of PRRS virus nor will it compromise the health of breeders in a variety of circumstances, including 'worst case' scenarios," Swalla said.

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